

## A new species of *Aniculus* Dana (Decapoda: Anomura: Diogenidae) from Hawaii

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*Abstract.*—A new and spectacular, but rarely seen, species of the hermit crab genus *Aniculus* Dana (*Aniculus hopperae*) is described and illustrated. It is compared and contrasted with *Aniculus maximus* Edmondson, the only other species of the genus known from the Hawaiian Islands and with *A. retipes* Lewinsohn, a species to which it is most morphologically related.

While diving at Pupukea on the north shore of the Hawaiian island of Oahu during June of 1995, the junior author collected an unfamiliar hermit crab inhabiting a drupe shell, *Drupa rubusidaeus* Röding, 1798 (aperture length about 2 cm). At a depth of about 8 m, the shell lay on boulder and rubble bottom adjacent to the low limestone cliffs of the shoreline containing a system of deep undercuts and small caves.

A brief literature search by the junior author revealed no named species to which it could be referred. However, a photograph of a similar animal from a popular book on hermit crabs (Giwojna 1978: 57) bore the following caption: "This species of *Dardanus* with red legs and claws and orange eye-stalks and antennae, hails from Hawaii."

The photographer, Scott Johnson, contacted by telephone, was able to locate an additional photograph of the species in question, taken at Makua, Oahu on a ledge at a depth of 8–10 m, a site on the western shore similar to that at Pupukea where the holotype was collected.

The Pupukea specimen was kept alive in a plastic container full of seawater that was changed every other day until it could be photographed in natural surroundings, then preserved in 70% alcohol and sent to the

senior author. It has now been deposited in the collection of the National Museum of Natural History, Smithsonian Institution (USNM). A second specimen, subsequently collected, has been deposited in the collection of the Bernice P. Bishop Museum (BPBM). Shield length (SL), measured from the midpoint of the anterior carapace margin to the midpoint of the posterior margin of the shield provides an indication of size.

*Aniculus hopperae*, new species  
Figs. 1–3

*Dardanus* species: Giwojna, 1978: 57, unnumbered figure.

*Holotype.*—♂ (SL = 6.32 mm), Pupukea, Oahu, Hawaii, 8 m, 18 Jun 1995, coll. J. Hoover; USNM 275921.

*Paratype.*—♂ (SL = 2.96 mm), Pupukea, Oahu, 10 m, 7 Oct 1995, coll. R. Holcom; BPBM S11284.

*Description.*—Shield (Figs. 1A, 2A) longer than broad, with few shallow depressions, but not divided into distinct lobes. Mesogastric region delimited posteriorly only by pair of furrows forming weak V; with deep transverse post-rostral furrow. Rostrum triangular, acute, approximately reaching level of well developed, spinose

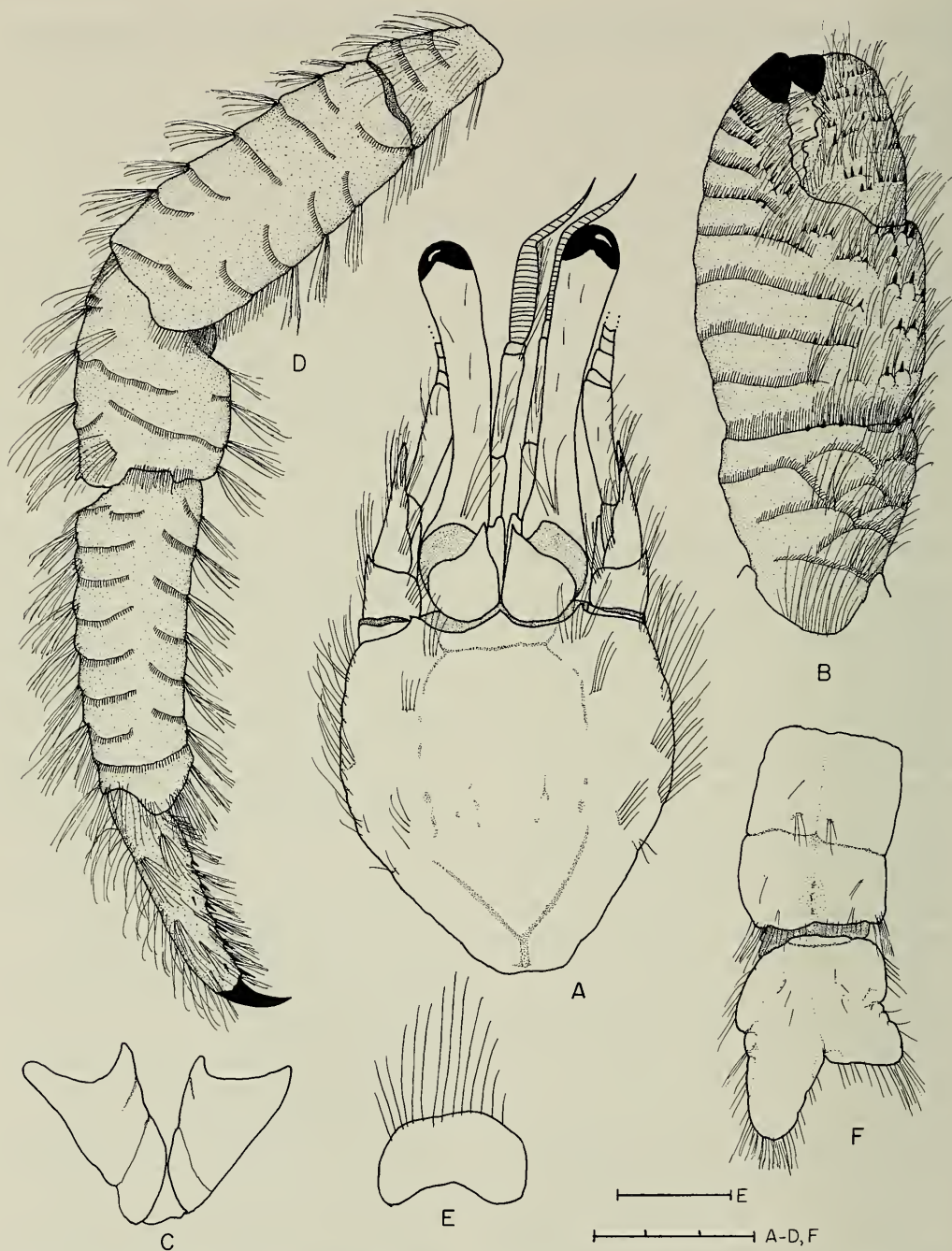


Fig. 1. *Aniculus hopperae*, new species. Holotype, USNM 275921: A, shield and cephalic appendages; B, carpus and chela of left cheliped (outer face); C, coxae of chelipeds (ventral view); D, third left pereopod (lateral view); E, anterior lobe of sternite of third pereopods; F, tergite of sixth abdominal somite and telson (dorsal view). Scales equal 3.0 mm (A-D, F) and 1.0 mm (E).

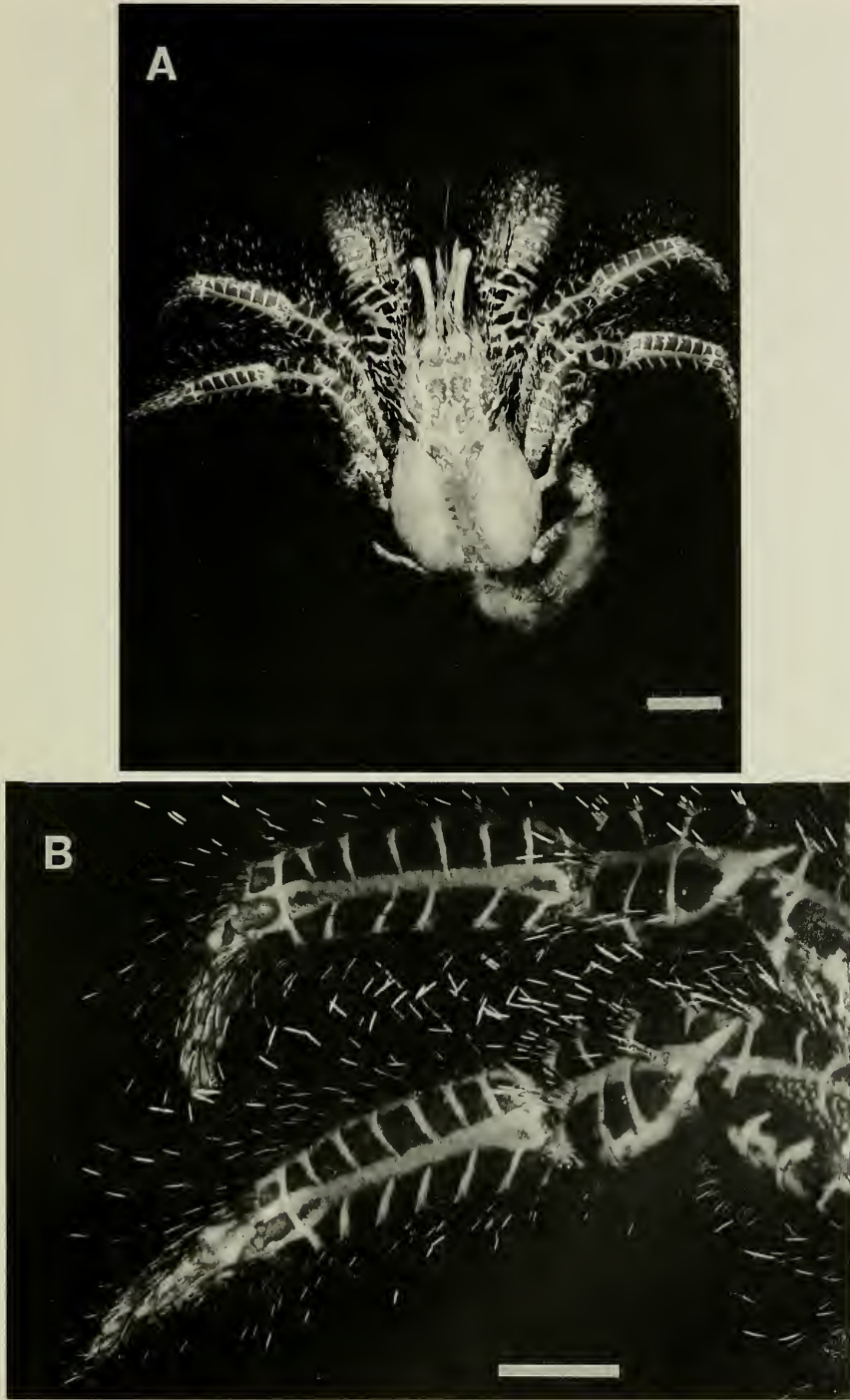


Fig. 2. *Aniculus hopperae*, new species. Holotype, USNM 275921: A, whole animal (dorsal view); B, left second and third pereopods (lateral view). Scales equal 4.0 mm (A) and 2.0 mm (B).



lateral projections. Ocular peduncles unequal in length, left longest, slightly longer than shield, bulbous basally, appreciably thinner medially; corneae not dilated. Ocular acicles very well developed, triangular, with simple terminal spine.

Antennular peduncles reaching to distal third of ocular peduncles. Ultimate and penultimate segments with scattered long, stiff setae. Basal segment with scattered stiff setae, and minute spinule on laterodistal margin.

Antennal peduncles shorter than antennular peduncles, reaching little beyond proximal half of ocular peduncles. Fifth, fourth and third segments unarmed, but with scattered long stiff setae, most abundant at ventrodistal margin of third. Second segment with dorsolateral distal angle produced, with small terminal spine practically obscured by long stiff setae; dorsomesial distal angle unarmed, mesial margin with long stiff setae. First segment with 3 or 4 spinules on ventrolateral margin distally. Antennal acicle subtriangular, elongate, reaching well beyond proximal margin of ultimate peduncular segment, with terminal spine obscured by tuft of long setae and additional tufts of similar setae mesially and laterally. Antennal flagellum long, overreaching outstretched chelipeds and ambulatory legs; each article with 1 or 2 minute setae.

Chelipeds (Figs. 1B, C, 2A, 3A, B) and ambulatory legs short. Chelipeds equal, similar; overreaching distal margin of corneae by half length of palm; tips of dactyls and fixed fingers reach slightly beyond proximal margins of dactyls of second pereopods and mid-length of dactyls of third. Dactyls slightly longer than palm; cutting edges of both dactyl and fixed finger with few large calcareous teeth, terminating in very prominent corneous hoof-like claws; dorsal and mesial surfaces of dactyls each with transverse rows of striae armed with small corneous spines and stiff setae, continuing onto ventral surfaces as rows of striae set with short stiff setae. Palms with

short, transverse rows of 1 to 4 corneous-tipped tubercles on dorsal surface in mesial fourth, remainder of palm and fixed finger with transverse striae almost completely circumscribing dorsal, lateral and mesial surfaces and set with rows of quite short setae ventrally and laterally, becoming longer and supplemented with corneous spinules on dorsal surface of fixed finger and medianly on dorsal surface of palm. Carpi approximately equaling length of palms; striae of dorsal surfaces not disposed in regular transverse lines but rather in network of curves inset with short stiff and few longer stiff setae, dorsomesial distal angles each with 1 prominent corneous-tipped spine and 3 corneous spinules on dorsodistal margin; mesial, lateral and ventral surfaces with transverse, sometimes short or interrupted, striae inset with short stiff setae. Meri subtriangular; dorsal margins with transverse rows of striae inset with short setae, extending onto lateral and ventral surfaces, dorsally accompanied by tufts of long setae; ventromesial margins each with 2 or 3 very small spines distally, ventral surfaces at mesial angles each with cluster of corneous-tipped spinules. Ischia each with 2 transverse striae inset with short setae on ventral surface. Coxae (Fig. 1C) each with very short stria mesially.

Second and third pereopods (Figs. 1D, 2B) similar from left to right, third pair slightly shorter than second; dactyls with tufts of long stiff setae on all surfaces, propodi, carpi, meri and ischia with tufts of long setae predominately dorsally and ventrally. Dactyls 0.75 to 0.80 length of propodi; dorsal surfaces of both second and third, and mesial and lateral faces of third each with irregular rows of corneous spinules; ventral margins each with 7 or 8 corneous spines. Propodi slightly longer than carpi and approximately equal to length of meri; 1 continuous transverse stria inset with short setae circumscribing dorsal, lateral and ventral surfaces distally, followed posteriorly by series of striae interrupted medially on lateral surfaces; mesial faces

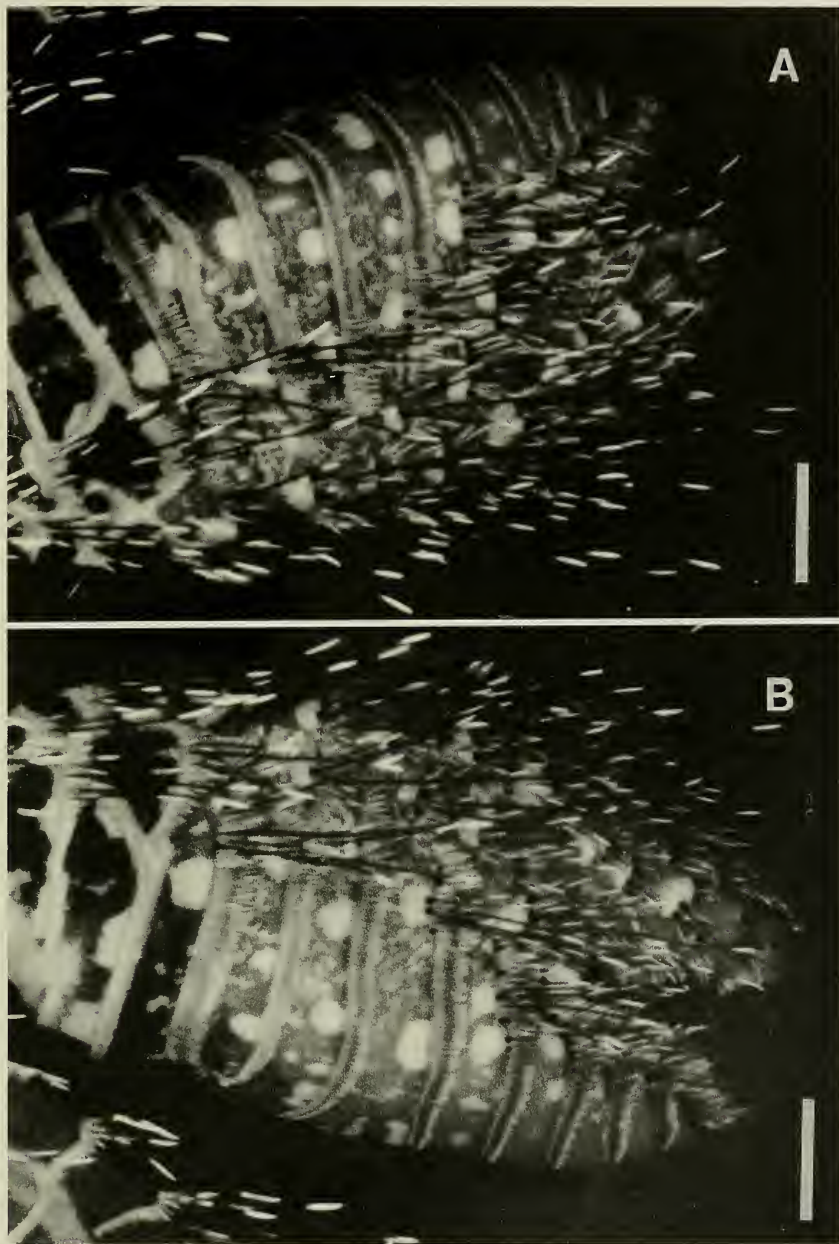


Fig. 3. *Aniculus hopperae*, new species. Holotype, USNM 275921: A, chela and carpus of left cheliped (dorsal view); B, chela and carpus of right cheliped (dorsal view). Scales equal 2.0 mm.

with scattered tufts of setae; ventrodistal margins each with 1 or 2 corneous spinules. Carpi with few transverse striae incompletely circumscribing dorsal, lateral and mesial surfaces; dorsodistal angles each with corneous-tipped spine. Meri each with

transverse striae circumscribing dorsal, lateral and ventral surfaces, interrupted medianly on lateral faces; striae of second pair much less distinct than third; second each with small spine at ventrolateral distal angle. Anterior lobe of sternite of third per-



eopods (Fig. 1E) subrectangular, with long marginal setae.

Tergites of abdominal somites 1–5 membranous but clearly delineated and ornamented with long greenish- or whitish-tipped red marginal setae; tergite of sixth (Fig. 1F) with dorsal longitudinal median furrow of anterior lobe very weakly marked, continued on posterior lobe as ovate depression and longitudinal series of deep pits posteriorly. Telson (Fig. 1F) with transverse suture not much more distinct than supplemental lateral notches; posterior lobes asymmetrical, subtriangular, left slightly to appreciably longer than right; with narrow median cleft; terminal margins with long setae, longest at external angles.

*Color.*—Long setae overall red proximally, greenish-white distally, short setae of striae greenish or yellowish-white; spines white with black corneous tips; claws and corneous spines black. Shield mottled red and white with purple tint medianly and anterior to post-rostral furrow. Ocular peduncles yellow; ocular acicles mottled red and white, with white terminal spinule. Antennular peduncles and flagella light yellow. Proximal segments of antennal peduncle and acicle mottled red and white; ultimate segment and flagella light purple. Chelae of chelipeds brilliant red with scattered white specks and splotches. Carpi brownish red with specks and splotches of white. Meri with lighter patches of brownish-red or mottled red and white on white background. Dactyls of ambulatory legs red with white patches. Propodi each with irregular longitudinal white band dorsally and ventrally; mesial faces mottled red and white; lateral faces red with white striae and median longitudinal band of purple. Carpi each with longitudinal white stripe on ventral surface; mesial faces mottled red and white; dorsal and lateral surfaces red, striae white, striae of lateral faces separated by longitudinal band of purple. Meri mottled red and white; longitudinal purple band of carpi continued on lateral faces dorsolaterally.

*Distribution.*—At present known only from two locations on Oahu, Hawaii; 8–10 m.

*Etymology.*—This species is named in honor of Dr. Carol N. Hopper, Director of Education at Honolulu's Waikiki Aquarium, an enthusiastic advocate of Hawaii's marine invertebrates, and an inspiration to the many young aspiring marine biologists who attend her classes.

*Affinities.*—*Aniculus hopperae* is immediately distinguished from the other resident Hawaiian species of the genus, *A. maximus* Edmondson, 1952, by its color, the sculpturing of the shield, the arrangement of striae on the ambulatory legs, and the armature of the tergite of the sixth abdominal somite. In *A. maximus*, the general color is intense orange or golden yellow with the striae set off by red-violet, the setae are yellow and the bristles red-tipped; the shield is marked by a series of furrows that clearly delineate the rhomboid mesogastric region common to most species of *Aniculus*; the transverse striae on the lateral faces of the propodi of the ambulatory legs are continuous; and the anterior lobe of the tergite of the sixth abdominal somite is armed with a cluster of spinules on either side of the midline. In contrast, the general color of *A. hopperae* is brilliant red, the striae often are white and the long setae are red, tipped with greenish white; the shield lacks any clear delineation of the mesogastric region; the striae of the lateral faces of the propodi of the ambulatory legs are interrupted by a broad smooth longitudinal band of purple; and the tergite of the sixth abdominal somite has an unarmed anterior lobe.

Forest (1984:59) remarked that *A. retipes* Lewinsohn, 1982 "... occupe une position incontestablement isolée par rapport aux autres espèces du genre." Those characters which set *A. retipes* apart included the lack of a delimited mesogastric region and the interruption of the striae on the lateral faces of the propodi of the ambulatory legs by a smooth longitudinal band. *Aniculus hopperae* shares both of these characters with *A.*

*retipes*. Additionally the tergite of the sixth abdominal somite has an unarmed anterior lobe in both species; however, that is a character common to all species except *A. maximus*. *Aniculus retipes* and *A. hopperae* are readily distinguished by their color patterns, as well as the different patterns of the striae on the carpi of the chelipeds. The ocular peduncles of *A. hopperae* are uniformly yellow, where as those of *A. retipes* have longitudinal red stripes. *Aniculus retipes*, particularly specimens from Phuket, Thailand, have appreciably longer antennular peduncles (Forest 1984:52, fig. 51) than seen in *A. hopperae*.

*Remarks.*—Like *A. hopperae*, the majority of the seven other described species of *Aniculus* are known from relatively few specimens. Only *A. aniculus* (Fabricius, 1787) and *A. ursus* (Olivier, 1811) can be considered common. However, most species have broad, albeit sporadic, distributions. For example, the other Hawaiian species, *A. maximus*, has also been reported from the Marquesas and Seychelles Islands. Similarly, the closely related *A. retipes* is known from the Red Sea to Zanzibar in the western Indian Ocean, to the west coast of Malaysia in the east, and in the western Pacific from the South China Sea and Banda Sea of Indonesia to Samoa (Forest 1984).

Twenty photographs of the living holotype were distributed to members of the Hawaiian Malacological Society, dive charter operators, Waikiki Aquarium staff and other likely acquaintances in the hope that further specimens and ecological data would come to light. Subsequently, John L. Earle, a long-time Oahu shell collector, informed the junior author that the crab was familiar to him, although not encountered very often. He could not cite an exact location or depth but said that he usually collected in

the rubble at the bottom of a drop-off near Makua, Oahu at a depth of about 23 m. The drop-off contains numerous undercuts and caves. In the absence of additional information, the authors postulate this species to be an uncommon inhabitant of exposed rocky Hawaiian shores at a depth of 8 to 23 m or more, in the vicinity of caves and ledges (where it may shelter during the enormous winter surf). It is almost certainly not an intertidal species; this biotope has been well sampled on Oahu for many years. Like many hermit crabs, it is probably most active at night.

#### Acknowledgments

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